eBASH:
ECRYPT Benchmarking of All Submitted Hashes

http://bench.cr.yp.to/ebash.html

D. J. Bernstein
University of Illinois at Chicago

Joint work with:
Tanja Lange
Technische Universiteit Eindhoven

ECRYPT, VAMPIRE

European Union has funded
ECRYPT I network (2004–2008),
ECRYPT II network (2008–2012).

ECRYPT's "virtual labs" include
many universities, companies.

VAMPIRE is the
"Virtual Application and
Implementation Lab" led by
Tanja Lange (Eindhoven),
Christof Paar (Bochum).

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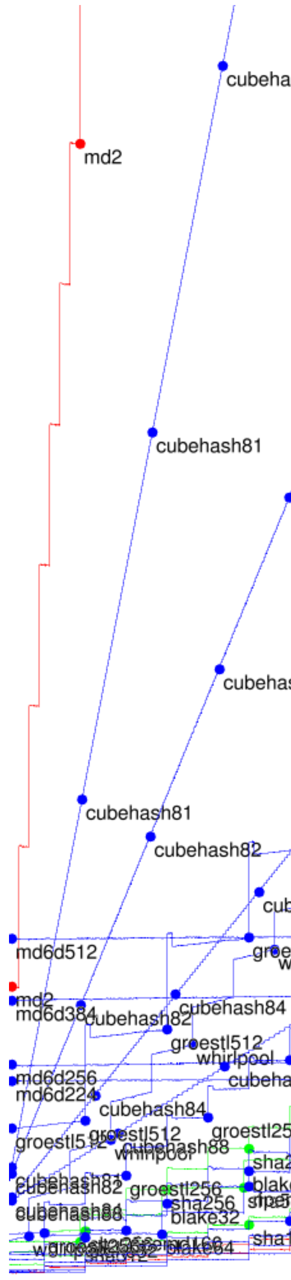

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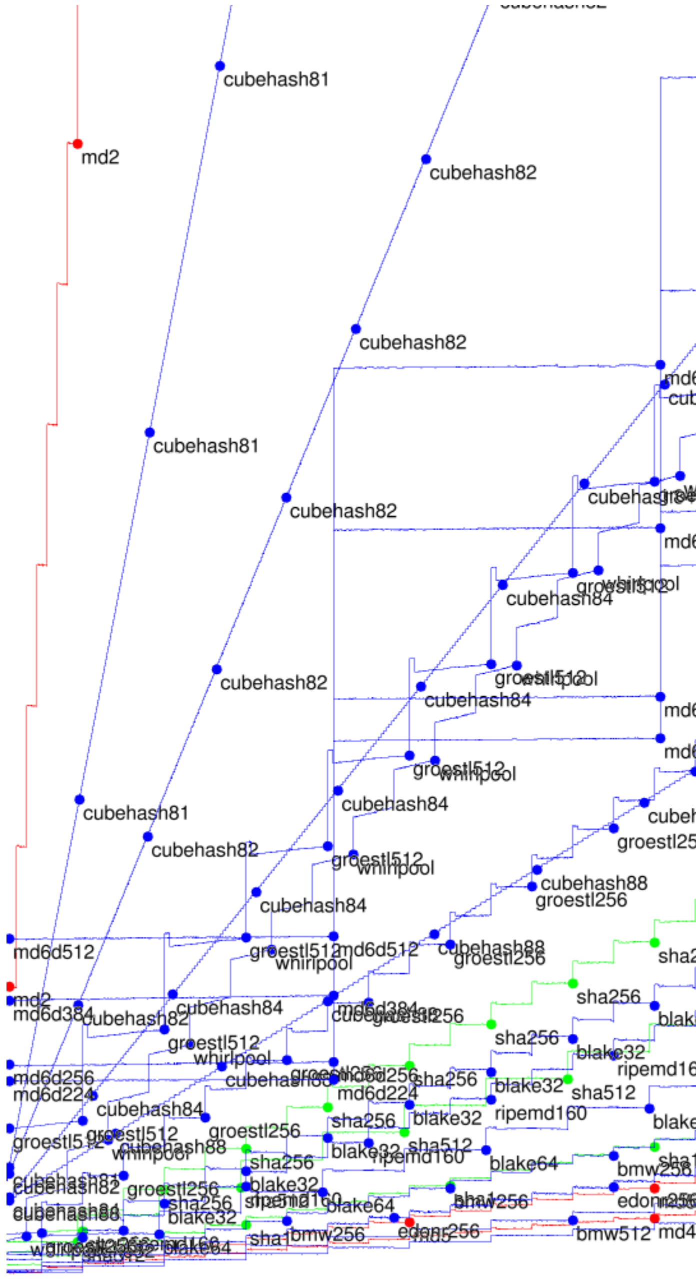

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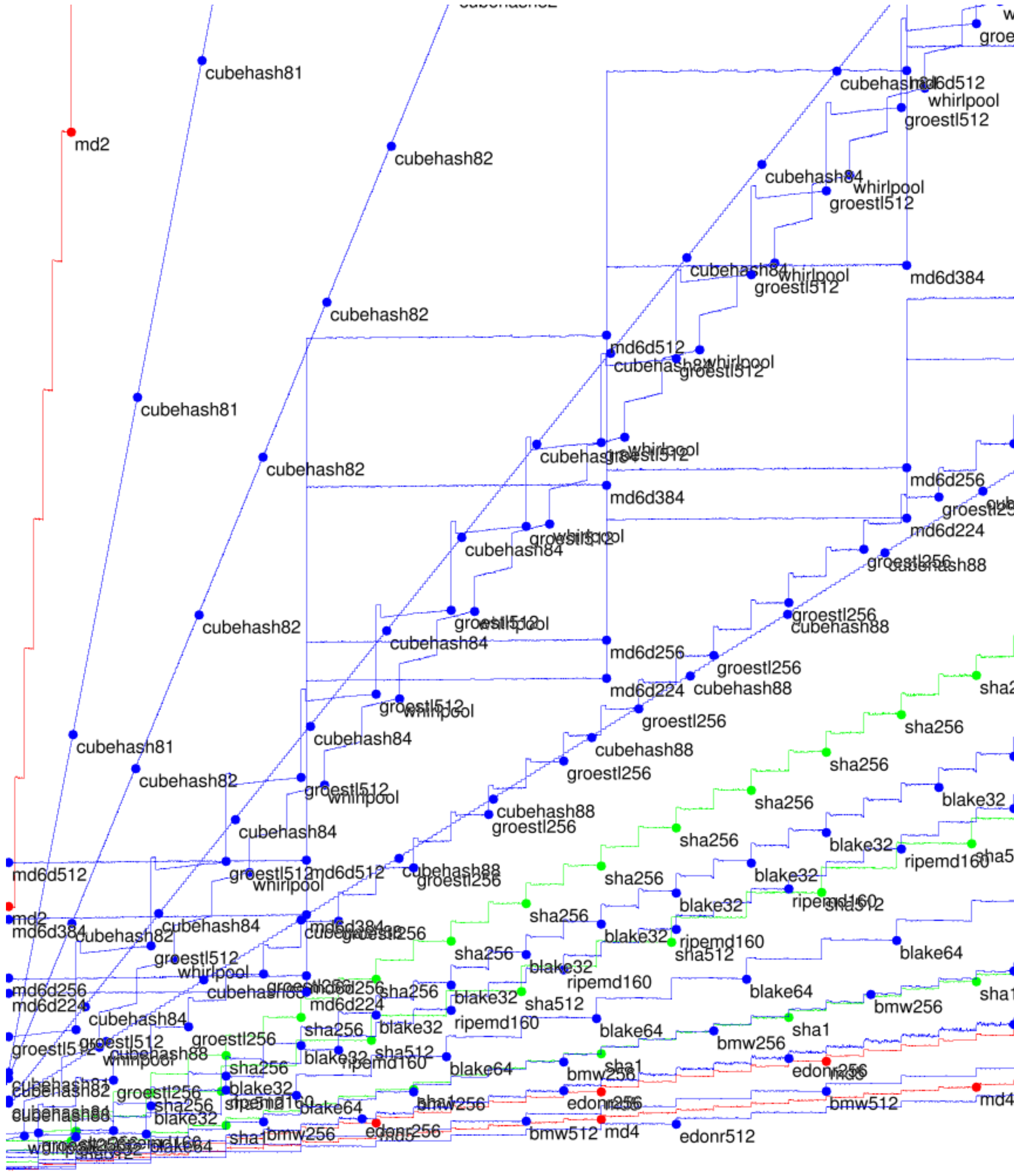

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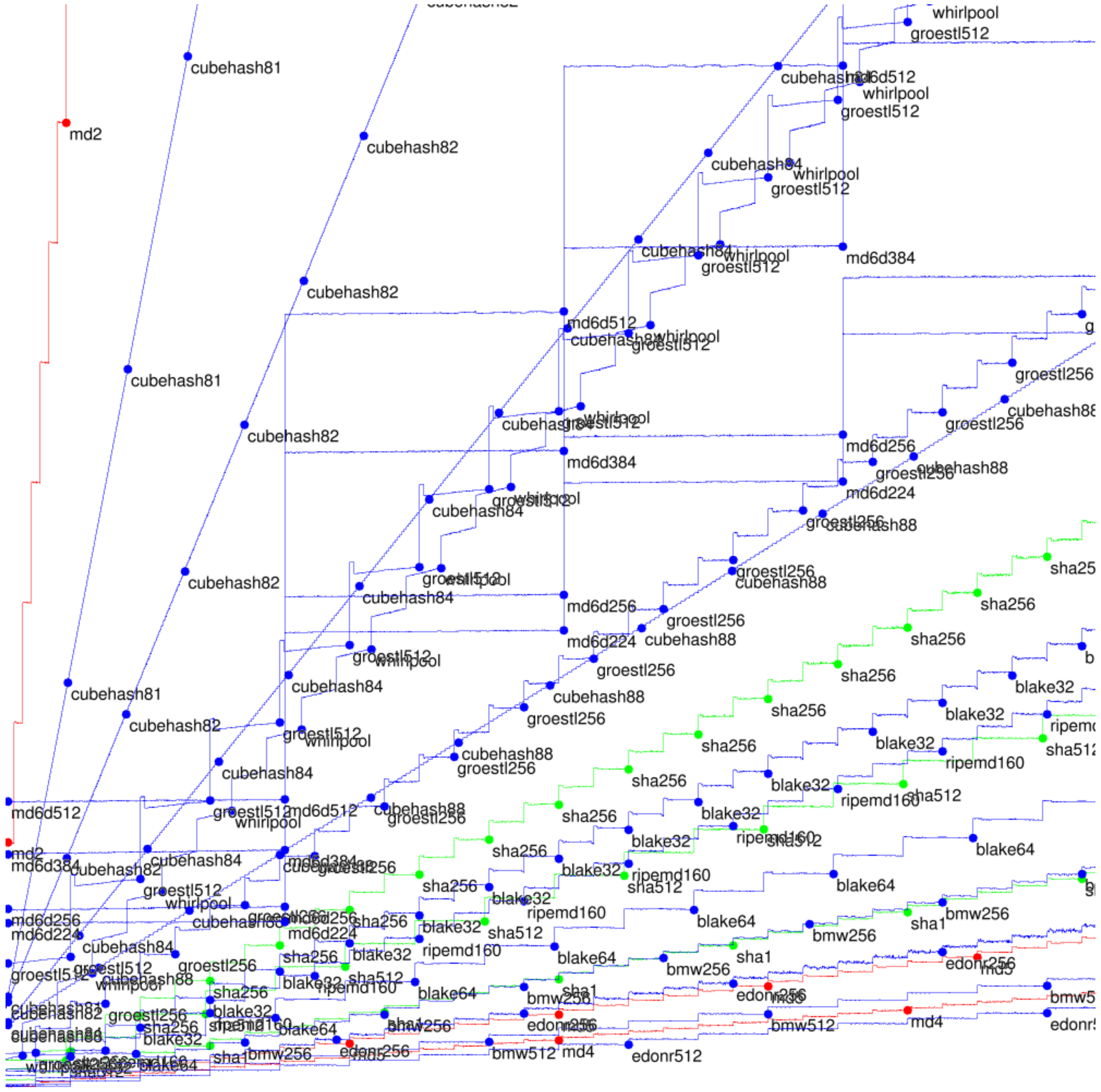

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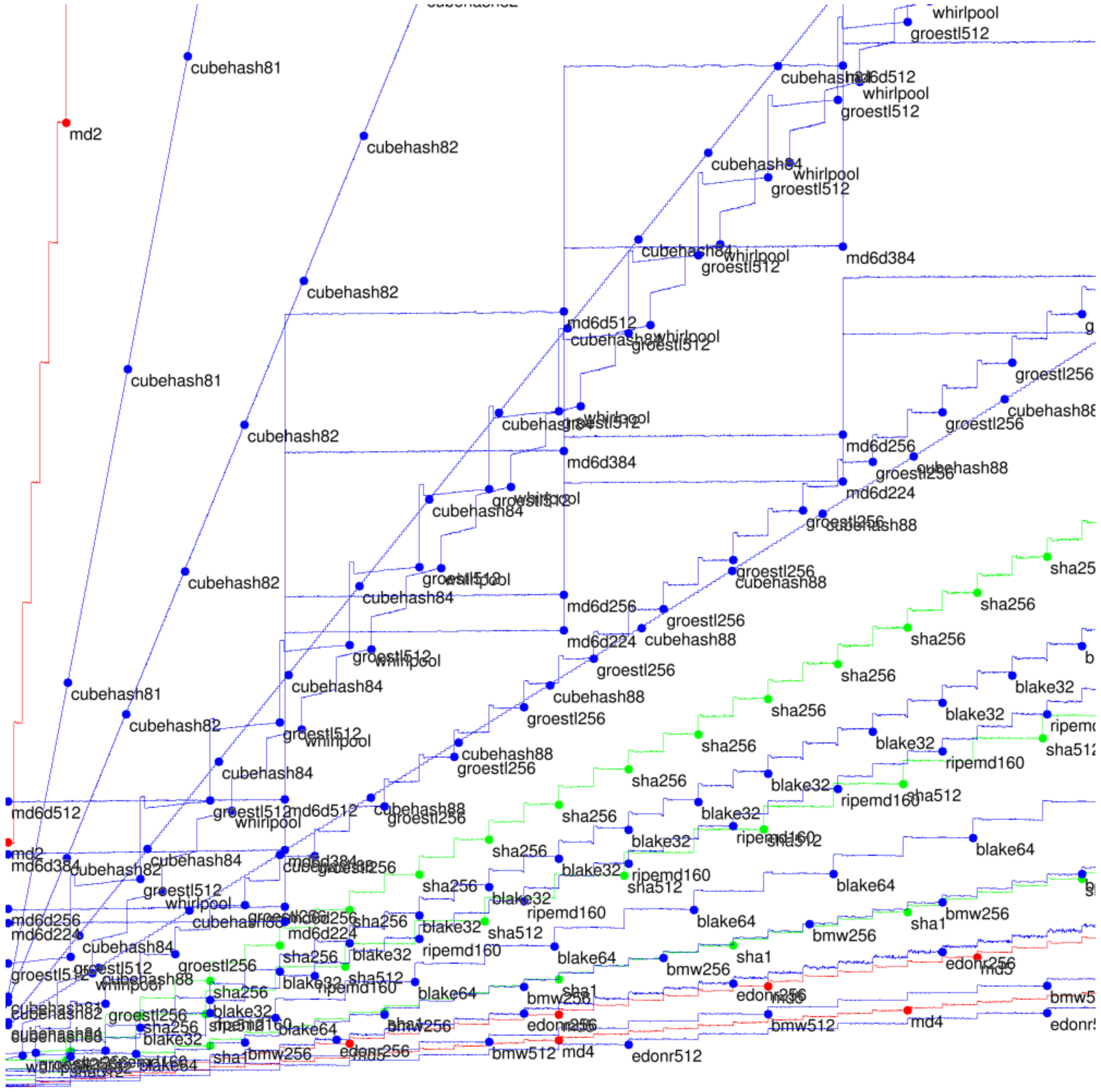

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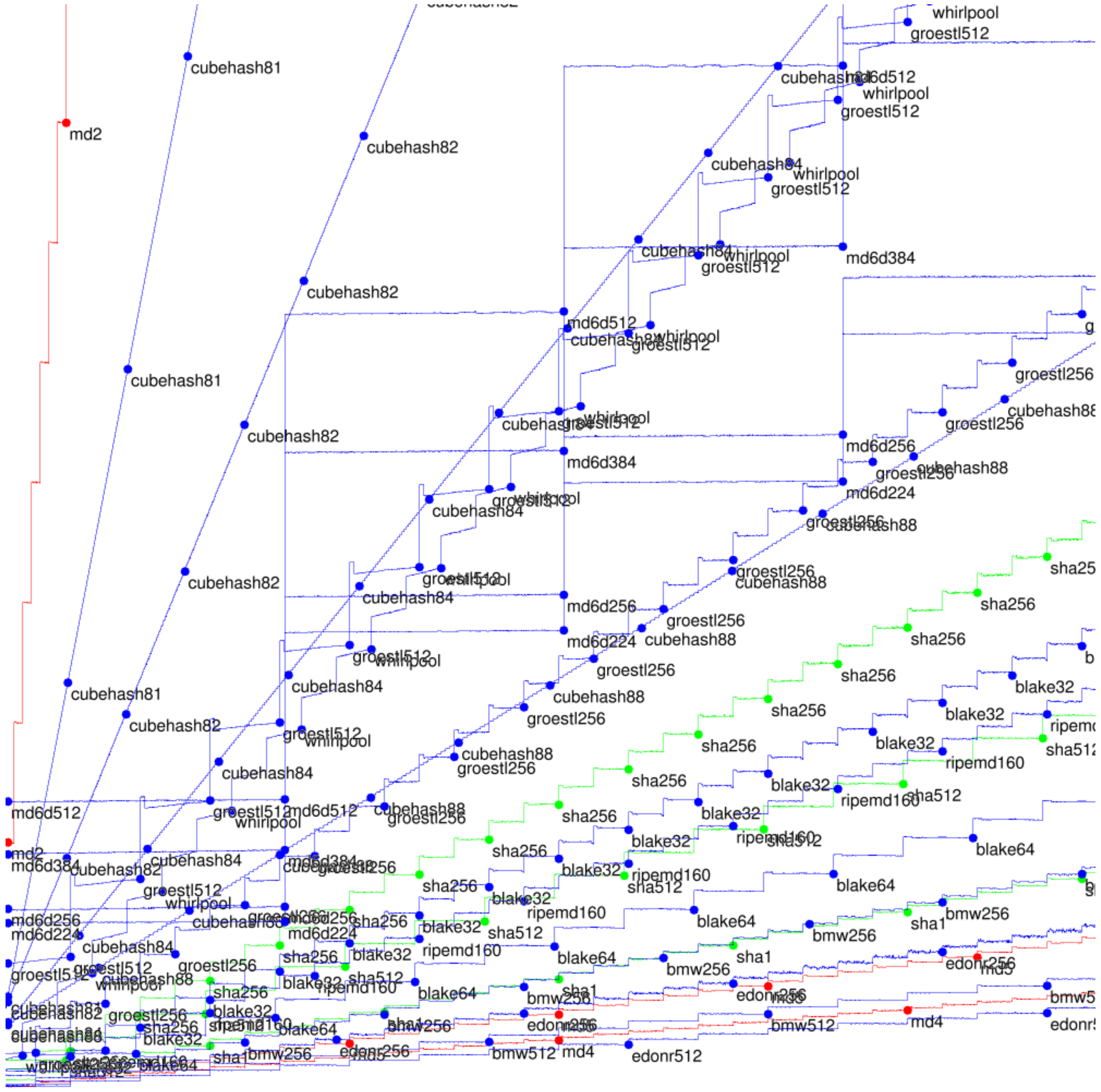

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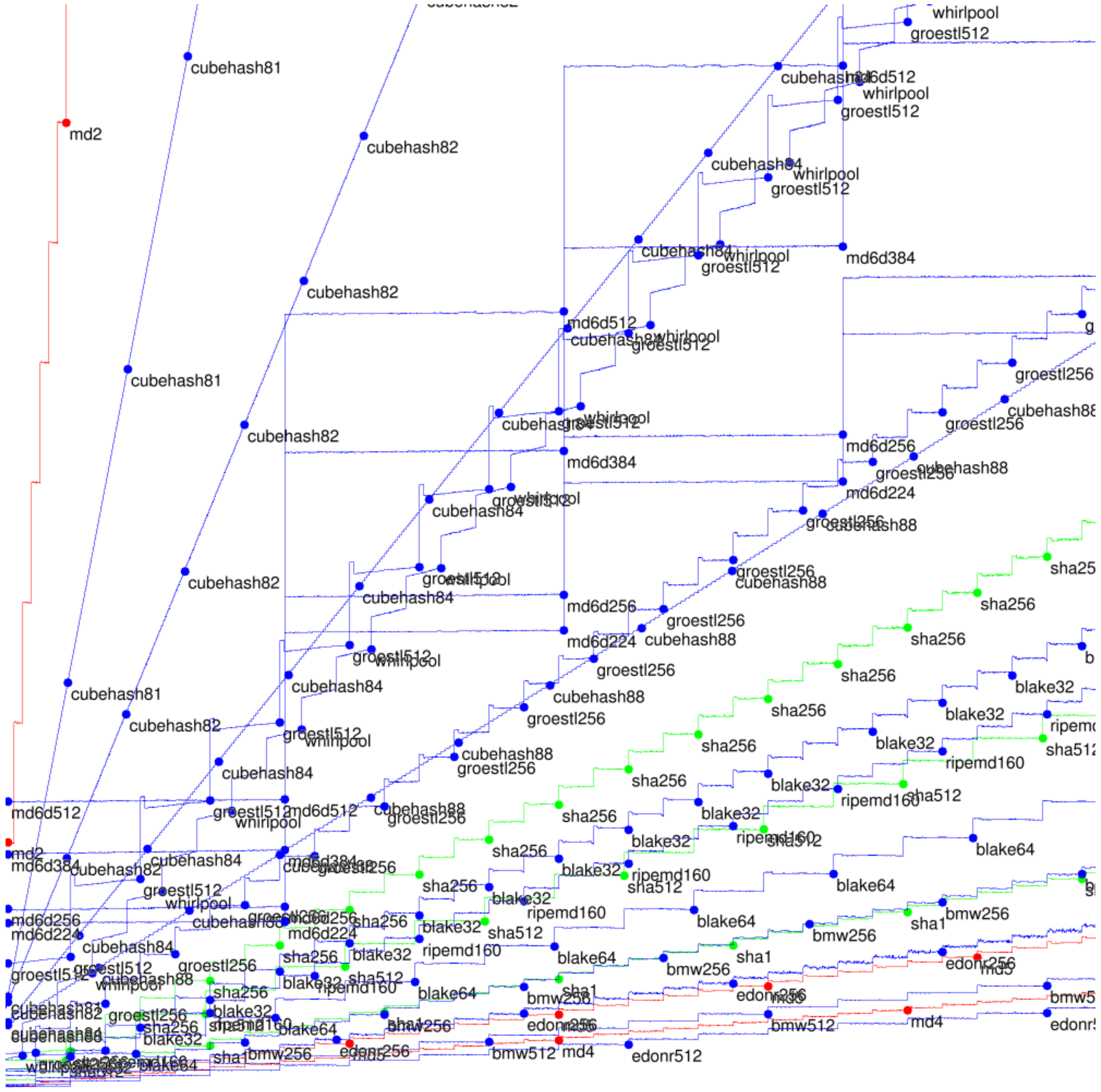

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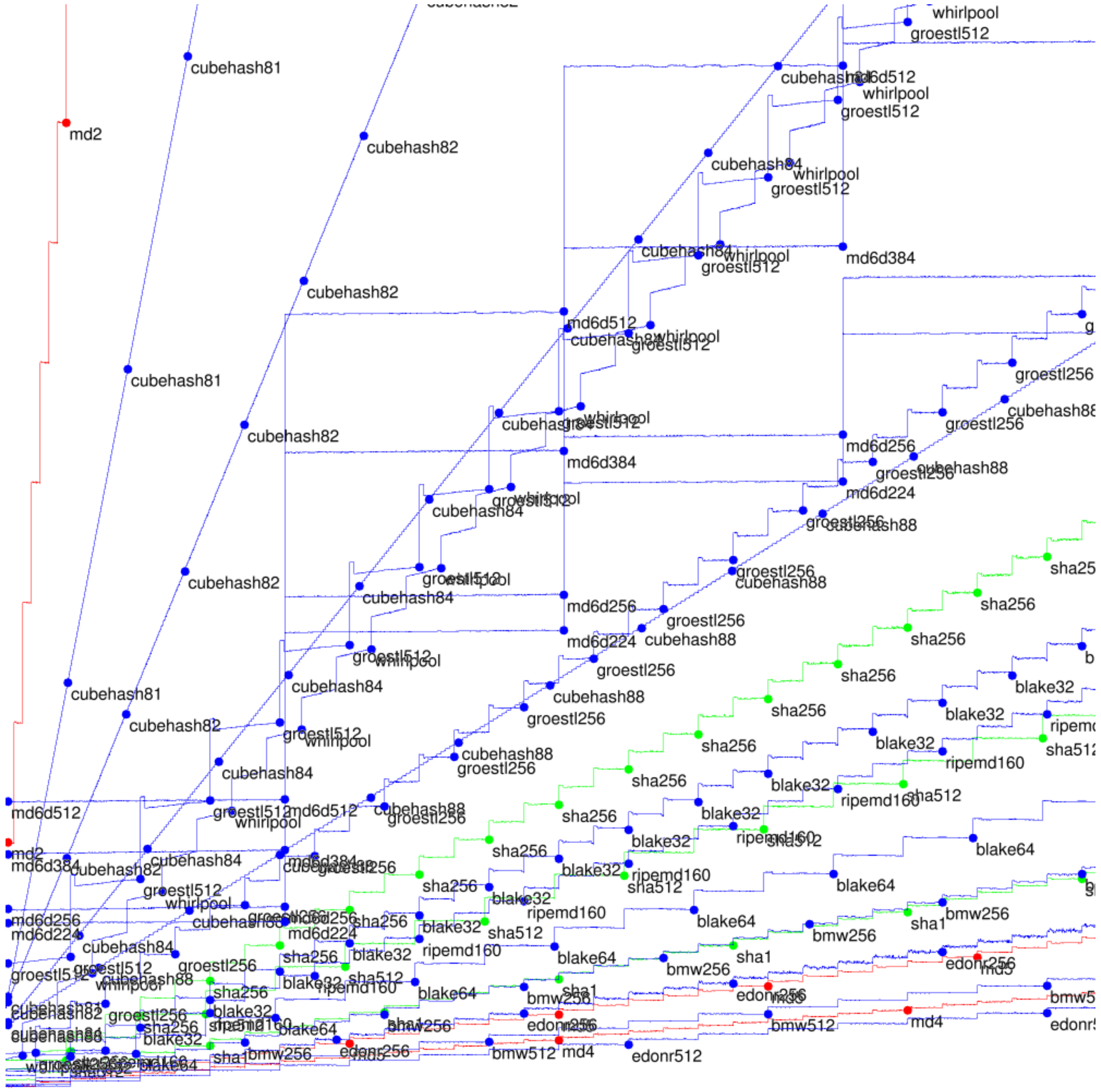

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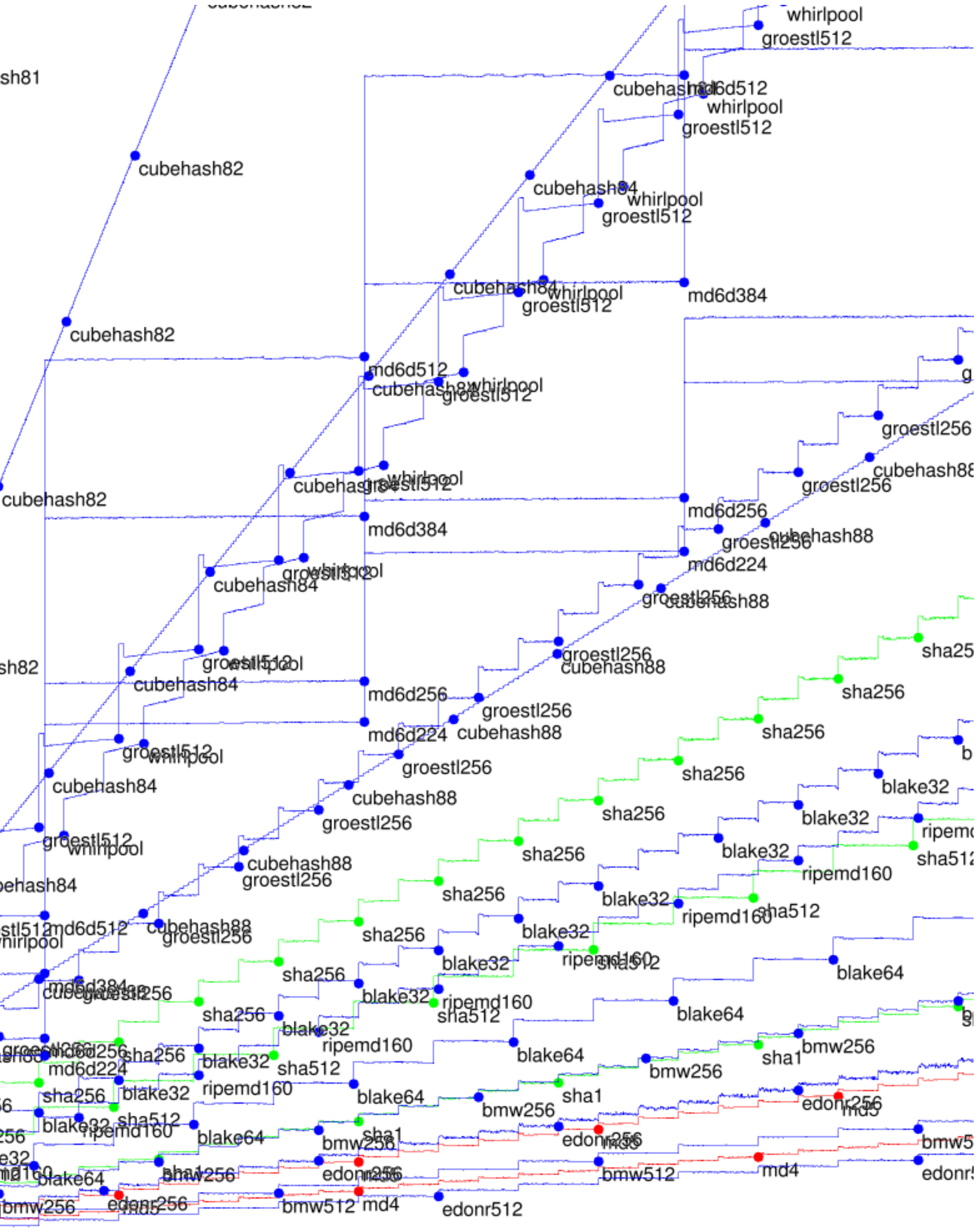

Tables show medians, quartiles of cycles/byte to hash 8-byte message, 64-byte message, 576-byte message, 1536-byte message, 4096-byte message, (extrapolated) long message.

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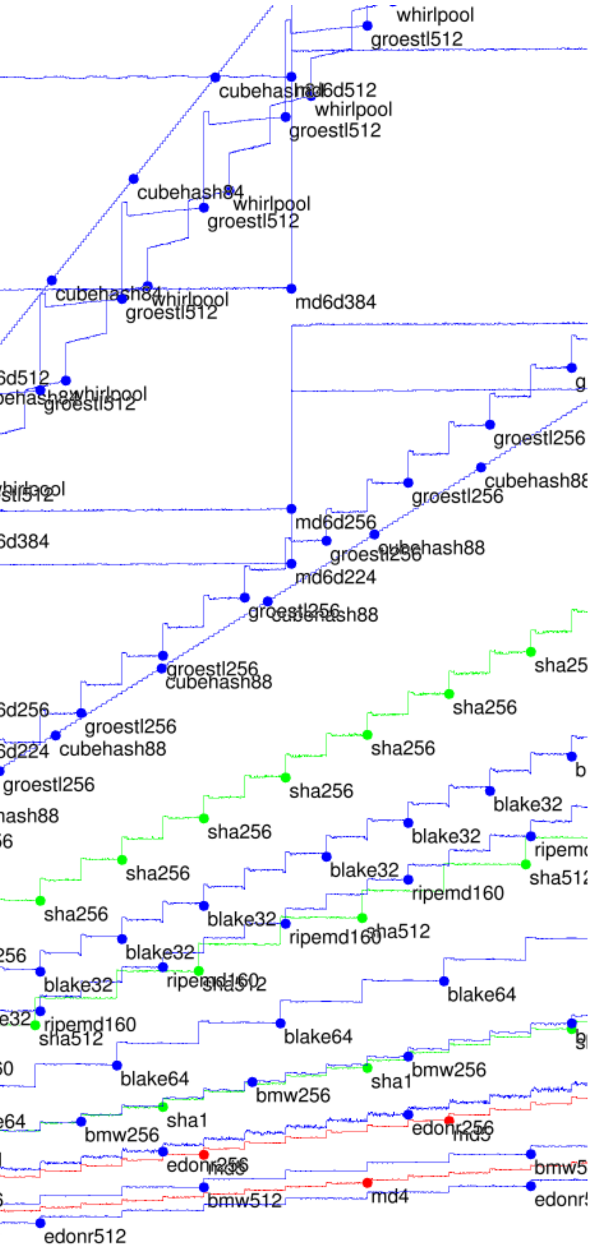

Tables show medians, quartiles of cycles/byte to hash
8-byte message,
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Actually have much more data.
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0-byte message, 1-byte message,
2-byte message, 3-byte message,
4-byte message, 5-byte message,
. . ., 2048-byte message.

e.g. 576 bytes, k
Core 2 Duo 6f6),

25%	50%	75
3.75	3.76	3.7
4.58	4.58	4.5
4.88	4.88	4.8
6.44	6.46	6.4
7.06	7.07	7.1
9.22	9.24	9.3
9.53	9.56	9.5
12.10	12.11	12.1
16.21	16.24	16.3
16.69	16.74	16.7
19.36	19.38	19.3
23.47	23.49	23.5
33.44	33.44	33.5

Tables show medians, quartiles of cycles/byte to hash 8-byte message, 64-byte message, 576-byte message, 1536-byte message, 4096-byte message, (extrapolated) long message.

Actually have much more data. e.g. Reports show best options. e.g. Graphs show medians for 0-byte message, 1-byte message, 2-byte message, 3-byte message, 4-byte message, 5-byte message, . . ., 2048-byte message.

e.g. 576 bytes, `katana` (21
Core 2 Duo 6f6), 64-bit AE

25%	50%	75%	hash
3.75	3.76	3.79	edonr5
4.58	4.58	4.58	md4
4.88	4.88	4.88	bmw51
6.44	6.46	6.46	md5
7.06	7.07	7.15	edonr2
9.22	9.24	9.31	bmw25
9.53	9.56	9.57	sha1
12.10	12.11	12.12	blake64
16.21	16.24	16.35	sha512
16.69	16.74	16.78	ripemd
19.36	19.38	19.38	blake32
23.47	23.49	23.53	sha256
33.44	33.44	33.51	groestl
			etc.

Tables show medians, quartiles of cycles/byte to hash
8-byte message,
64-byte message,
576-byte message,
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4096-byte message,
(extrapolated) long message.

Actually have much more data.
e.g. Reports show best options.
e.g. Graphs show medians for
0-byte message, 1-byte message,
2-byte message, 3-byte message,
4-byte message, 5-byte message,
. . ., 2048-byte message.

e.g. 576 bytes, `katana` (2137MHz Core 2 Duo 6f6), 64-bit ABI:

25%	50%	75%	hash
3.75	3.76	3.79	edonr512
4.58	4.58	4.58	md4
4.88	4.88	4.88	bmw512
6.44	6.46	6.46	md5
7.06	7.07	7.15	edonr256
9.22	9.24	9.31	bmw256
9.53	9.56	9.57	sha1
12.10	12.11	12.12	blake64
16.21	16.24	16.35	sha512
16.69	16.74	16.78	ripemd160
19.36	19.38	19.38	blake32
23.47	23.49	23.53	sha256
33.44	33.44	33.51	groestl256
			etc.

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e.g. 576 bytes, `katana` (2137MHz Core 2 Duo 6f6), 64-bit ABI:

25%	50%	75%	hash
3.75	3.76	3.79	edonr512
4.58	4.58	4.58	md4
4.88	4.88	4.88	bmw512
6.44	6.46	6.46	md5
7.06	7.07	7.15	edonr256
9.22	9.24	9.31	bmw256
9.53	9.56	9.57	sha1
12.10	12.11	12.12	blake64
16.21	16.24	16.35	sha512
16.69	16.74	16.78	ripemd160
19.36	19.38	19.38	blake32
23.47	23.49	23.53	sha256
33.44	33.44	33.51	groestl256
			etc.

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e.g. 576 bytes, `katana` (2137MHz Core 2 Duo 6f6), 64-bit ABI:

25%	50%	75%	hash
3.75	3.76	3.79	edonr512
4.58	4.58	4.58	md4
4.88	4.88	4.88	bmw512
6.44	6.46	6.46	md5
7.06	7.07	7.15	edonr256
9.22	9.24	9.31	bmw256
9.53	9.56	9.57	sha1
12.10	12.11	12.12	blake64
16.21	16.24	16.35	sha512
16.69	16.74	16.78	ripemd160
19.36	19.38	19.38	blake32
23.47	23.49	23.53	sha256
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e.g. 576 bytes, `katana` (2137MHz Core 2 Duo 6f6), 64-bit ABI:

25%	50%	75%	hash
3.75	3.76	3.79	edonr512
4.58	4.58	4.58	md4
4.88	4.88	4.88	bmw512
6.44	6.46	6.46	md5
7.06	7.07	7.15	edonr256
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19.36	19.38	19.38	blake32
23.47	23.49	23.53	sha256
33.44	33.44	33.51	groestl256
			etc.

Submitter → eBASH

Define output size in `api.`

```
#define CRYPTO_BYTES
```

e.g. 576 bytes, `katana` (2137MHz Core 2 Duo 6f6), 64-bit ABI:

25%	50%	75%	hash
3.75	3.76	3.79	edonr512
4.58	4.58	4.58	md4
4.88	4.88	4.88	bmw512
6.44	6.46	6.46	md5
7.06	7.07	7.15	edonr256
9.22	9.24	9.31	bmw256
9.53	9.56	9.57	sha1
12.10	12.11	12.12	blake64
16.21	16.24	16.35	sha512
16.69	16.74	16.78	ripemd160
19.36	19.38	19.38	blake32
23.47	23.49	23.53	sha256
33.44	33.44	33.51	groestl256
			etc.

Submitter → eBASH

Define output size in `api.h`:

```
#define CRYPTO_BYTES 64
```

e.g. 576 bytes, `katana` (2137MHz Core 2 Duo 6f6), 64-bit ABI:

25%	50%	75%	hash
3.75	3.76	3.79	edonr512
4.58	4.58	4.58	md4
4.88	4.88	4.88	bmw512
6.44	6.46	6.46	md5
7.06	7.07	7.15	edonr256
9.22	9.24	9.31	bmw256
9.53	9.56	9.57	sha1
12.10	12.11	12.12	blake64
16.21	16.24	16.35	sha512
16.69	16.74	16.78	ripemd160
19.36	19.38	19.38	blake32
23.47	23.49	23.53	sha256
33.44	33.44	33.51	groestl256
			etc.

Submitter → eBASH

Define output size in `api.h`:

```
#define CRYPTO_BYTES 64
```

Define hash function in `hash.c`, e.g. wrapping existing NIST API:

```
#include "crypto_hash.h"
#include "SHA3api_ref.h"
int crypto_hash(
  unsigned char *out,
  const unsigned char *in,
  unsigned long long inlen)
{ Hash(crypto_hash_BYTES*8
       ,in,inlen*8,out);
  return 0; }
```

6 bytes, katana (2137MHz
Duo 6f6), 64-bit ABI:

50%	75%	hash
3.76	3.79	edonr512
4.58	4.58	md4
4.88	4.88	bmw512
6.46	6.46	md5
7.07	7.15	edonr256
9.24	9.31	bmw256
9.56	9.57	sha1
12.11	12.12	blake64
16.24	16.35	sha512
16.74	16.78	ripemd160
19.38	19.38	blake32
23.49	23.53	sha256
33.44	33.51	groestl256
		etc.

Submitter → eBASH

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#define CRYPTO_BYTES 64
```

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```
#include "crypto_hash.h"
#include "SHA3api_ref.h"
int crypto_hash(
    unsigned char *out,
    const unsigned char *in,
    unsigned long long inlen)
{ Hash(crypto_hash_BYTES*8
          ,in,inlen*8,out);
    return 0; }
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atana (2137MHz

. 64-bit ABI:

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79	edonr512
58	md4
38	bmw512
46	md5
15	edonr256
31	bmw256
57	sha1
12	blake64
35	sha512
78	ripemd160
38	blake32
53	sha256
51	groestl256
	etc.

Submitter → eBASH

Define output size in `api.h`:

```
#define CRYPTO_BYTES 64
```

Define hash function in `hash.c`, e.g. wrapping existing NIST API:

```
#include "crypto_hash.h"
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int crypto_hash(
  unsigned char *out,
  const unsigned char *in,
  unsigned long long inlen)
{ Hash(crypto_hash_BYTES*8
       ,in,inlen*8,out);
  return 0; }
```

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`crypto_hash/yo`

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More details and

`http://bench.c`

`/call-hash.htm`

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Submitter → eBASH

Define output size in api.h:

```
#define CRYPTO_BYTES 64
```

Define hash function in hash.c, e.g. wrapping existing NIST API:

```
#include "crypto_hash.h"
#include "SHA3api_ref.h"
int crypto_hash(
  unsigned char *out,
  const unsigned char *in,
  unsigned long long inlen)
{ Hash(crypto_hash_BYTES*8
       ,in,inlen*8,out);
  return 0; }
```

Send to the mailing list the URL of a tar.gz with one directory crypto_hash/yourhash/ containing hash.c etc.

Measurements magically ap

Much easier than trying to do your own benchmark

More details and options:
http://bench.cr.yp.to
/call-hash.html

Submitter → eBASH

Define output size in `api.h`:

```
#define CRYPTO_BYTES 64
```

Define hash function in `hash.c`, e.g. wrapping existing NIST API:

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#include "SHA3api_ref.h"
int crypto_hash(
  unsigned char *out,
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Send to the mailing list
the URL of a `tar.gz`
with one directory
`crypto_hash/yourhash/ref`
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Measurements magically appear!
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More details and options:
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